MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2022

July–September 2022—Volume 137, pp. 603–614

https://doi.org/10.5248/137.603

New records and hosts of lichenicolous fungi from India

Shweta Sharma[1,2], Siljo Joseph[1,3], Sanjeeva Nayaka[1,2]*

[1] *Lichenology laboratory, CSIR-National Botanical Research Institute, Lucknow - 226 001, India*

[2] *Academy of Scientific and Innovative Research (AcSIR), CSIR-HRDC Campus, Kamala Nehru Nagar, Ghaziabad - 201 002, India*

[3] *Present address: Forest Botany Department, Forest Ecology and Biodiversity Conservation Division, KSCSTE-Kerela Forest Research Institute, Peechi - 680 653, Thrissur, India*

*Correspondence to: *nayaka.sanjeeva@gmail.com*

Abstract—Eight lichenicolous fungi are reported as new records from India: *Cladophialophora* aff. *megalosporae*, *Nesolechia falcispora*, *Phacopsis oxyspora* var. *defecta*, *Punctelia oxyspora*, *Sclerococcum phaeophysciae*, *Scutula epiblastematica*, *Spirographa lichenicola*, and *Zwackhiomyces kantvilasii*. Also reported are new hosts for *Cladophialophora* aff. *megalosporae*, *Nesolechia falcispora*, *Sclerococcum phaeophysciae*, *Scutula epiblastematica*, and *Zwackhiomyces kantvilasii*.

Key words—biodiversity, *Lecanorales*, parmelioid lichens, taxonomy

Introduction

Lichenicolous fungi represent a highly specialized and successful group of organisms that live exclusively on lichens, most commonly as lichen parasites, but also as broad-spectrum pathogens, saprotrophs, or commensals (Diederich & al. 2018). A total of 2319 lichenicolous fungal species (Diederich & al. 2018) has been reported from different parts of the world, and many more species are being added to this list. The study of lichenicolous fungi in India has been initiated in the last decade, and at present there are 185 total taxa reported from the country (Joshi 2018, 2020, 2021; Singh & Singh 2019; Joshi & al. 2020a,b), far fewer than what has been

reported from many other countries. The herbarium LWG of CSIR-National Botanical Research Institute, Lucknow harbors a rich collection of lichen comprising almost 150,000 specimens. Several interesting taxa have been found during the examination of lichenicolous fungi from these herbarium materials.

Here we report eight lichenicolous taxa new to India and growing mainly on parmelioid lichens. The continual discovery of lichenicolous fungi in recent years indicates that India has a high diversity of these organisms yet to be explored. Several ongoing studies on lichenicolous fungi promise to add to Indian biodiversity.

Materials & methods

The specimens examined are housed in the Herbarium, CSIR-National Botanical Research Institute, Lucknow, India (LWG), which also includes herbarium of Lucknow University (LWG-LWU). They were examined morphologically using a Leica S8APO stereo zoom microscope and anatomically with a Leica DM2500 compound microscope. Hand-cut sections mounted in water were photographed with a Leica EC3 camera and analysed using LASEZ software. Amyloid reactions were tested in Lugol's iodine solution with or without KOH pretreatment. All measurements were taken from water mounts; the length, breadth, and length/breadth ratio is given as (min–){x–SD}–{x+SD}(–max), where 'min' and 'max' are the extreme values, x is the arithmetic mean, SD is standard deviation, and 'n' is the total number of measurements.

Taxonomy

Cladophialophora* aff. *megalosporae Diederich,
Fung. Divers. 58: 70, 2013. FIG. 1A,B

CONIDIOMATA forming brown to black-colored colonies on lichen thallus and apothecial margins, 0.15–3 mm wide, sessile to sub sessile, with immersed mycelium, brown to black; CONIDIOPHORES pale brown to brown; CONIDIA numerous, aseptate, subspherical, rarely adhering in short, branched, acropetal chains, pale brown to reddish brown, (2.5–)2.7–3.4 (–3.5) × (2.0–)2.2–2.7(–3.0) µm, l/b ratio (1.0–)1.1– 1.4(–1.6), (n = 20).

SPECIMENS EXAMINED: **INDIA, SIKKIM, North Sikkim**, Kalep before Thangu, elev. 3900 m, on *Hypotrachyna scytophylla* growing on bark, 12 August 2004, D.K. Upreti, S. Chatterjee & P.K. Divakar 04-003846 (LWG 14694); **UTTARAKHAND, Pithoragarh district**, Narayan Swami Asharam, elev. 2748 m, on *Myelochroa macrogalbinica* growing on bark, 2 November 2009, D.K. Upreti 09-013442 (LWG 13455).

COMMENTS—*Cladophialophora* aff. *megalosporae* has been reported from U.S.A., Papua New Guinea (Diederich & al. 2013), and Vietnam

(Zhurbenko & al. 2020). In India, the species is being reported from Sikkim and Uttarakhand. The closely related *C. hawksworthii* (Etayo & Diederich) Diederich differs from *C. megalosporae* by having larger (2.5–4 µm) conidia. The conidia of *C. hawksworthii* are greyish brown while *C. megalosporae* are brown to reddish-brown. Previously, *C. megalosporae* has been reported occurring only on crustose *Megalospora* spp., but in India it was found growing on the foliose lichens *Hypotrachyna scytophylla* (Kurok.) Hale and *Myelochroa macrogalbinica* Divakar & al. Additional collections may suggest Indian specimens as a new species due to the host variation. At present, we are treating it here as *Cladophialophora* aff. *megalosporae*.

Nesolechia falcispora (Triebel & Rambold) Diederich,
Bryologist 121: 394, 2018. FIG. 1C,D

APOTHECIA brown to black on lichen thallus, numerous, round, 0.1–0.35 mm, dispersed to crowded, sometimes forming gall like structures, immersed to sessile, margin indistinct; EXCIPULUM pale brown to brown, 20–40 µm thick; EPIHYMENIUM light brown to brown, 12–17 µm high; HYMENIUM hyaline to slightly brownish, 55–70 µm high, I–; PARAPHYSES septate, sometimes branched, with brown swollen tips; HYPOTHECIUM pale brown, 60–80 µm high, I+ violet; ASCI 8-spored, clavate, 50–55 × 15–18 µm, tholus I+ blue; ASCOSPORES hyaline, aseptate, falciform to lemon shaped, (10.1–)11.8–15.0(–16.3) × (3.8–)4.8–6.2(–7.2) µm, l/b ratio (1.6–)2.1–2.9 (–3.3), (n = 32).

SPECIMENS EXAMINED: **INDIA, HIMACHAL PRADESH, Shimla district**, Rohru, Jubbal, along Sandali naala, elev. 1650 m, on *Myelochroa aurulenta* growing on rock, 20 May 2002, S. Nayaka & R. Srivastava 02-87166 (LWG 17508); **SIKKIM, North Sikkim**, above Lachung towards Yumthang, elev. 3000 m, on *Hypotrachyna incognita* growing on rocks, 16 August 2004, D.K. Upreti, S. Chatterjee & P.K. Divakar 04-004243 (LWG 14761); **UTTARAKHAND, Chamoli district**, way of Nanda Devi Biosphere Reserve, Kanukdhara, elev. 3500 m, on *Flavopunctelia flaventior* growing on *Betula utilis*, 07 June 2008, S. Rawat 08-011232 (LWG 13207); Joshimath, elev. 1700 m, on *Punctelia subrudecta* growing on rock, 18 January 2008, S. Rawat 08-008800 (LWG 21404); **Champawat district**, Lohaghat, on *Myelochroa xantholepis* growing on bark, 29 October 2009, D.K. Upreti & al. 09-012659 (LWG 13417); **Uttarkashi district**, Govind Wildlife Sanctuary, Sankoni behind GMVN guest house, elev. 1975 m, 31.0791°N78.1844° E, on *P. subrudecta* growing on bark of apple tree, 07 November 2012, R. Bajpai 12-018922 (LWG 28563).

COMMENTS—*Nesolechia falcispora* was previously reported from South Africa (Triebel & al. 1995). In India, the species is found in the states of Himachal Pradesh, Sikkim, and Uttarakhand. The closely related species,

Punctelia oxyspora, differs from *N. falcispora* by having much larger (16–21 × 5–7 µm) falciform to lemon-shaped ascospores. The species was previously reported to occur only on species of *Usnea*, but in India many parmelioid lichens were found as its host. In India hosts include *Flavopunctelia flaventior* (Stirt.) Hale, *Hypotrachyna incognita* (Kurok.) Hale, *Myelochroa aurulenta* (Tuck.) Elix & Hale, *M. xantholepis* (Mont. & Bosch) Elix & Hale, and *Punctelia subrudecta* (Nyl.) Krog.

Phacopsis oxyspora var. ***defecta*** Triebel & Rambold,
Bryologist 98: 79, 1995. FIG. 1E,F

APOTHECIA semi immersed to immersed in host lichen thalli, crowded, 0.2–0.4 mm in diam., disc brown to dark brown, margin indistinct; EXCIPULUM 25–35 µm thick, pale brown; EPIHYMENIUM pale brown, 15–20 µm high; HYMENIUM hyaline, 40–60 µm high, I–; PARAPHYSES septate, anastomosed with dark brown swollen tips; HYPOTHECIUM colorless to pale brown, 40–80 µm high, I–; ASCI 8-spored, clavate, 43–52 × 14–17 µm, tholus I+ blue; ASCOSPORES hyaline, aseptate, mostly ellipsoid, (14.1–)14.5–16.5 (–17.6) × (5.1–)5.4–6.2(–6.6) µm, l/b ratio (2.1–)2.4–3.0(–3.2), (n = 15).

SPECIMENS EXAMINED: **INDIA, HIMACHAL PRADESH, Baes river valley**, Manali, elev. 1800 m, on *Punctelia rudecta* growing on *Cedrus deodara*, 15 June 1975, D.D. Awasthi & K. Dange 75-003 (LWG-LWU 15782); **Chamba district**, in and around Khajiar, elev. 2000 m, on *P. rudecta* growing on *Cedrus deodara*, 15 May 2001, D.K. Upreti & S. Nayaka 01-75438 (LWG 21441); **UTTARAKHAND, Chamoli district,** way of Nanda Devi Biosphere Reserve, Lata, elev. 2900 m, on *P. rudecta* growing on rock, 05 June 2008, S. Rawat 08-011078 (LWG 21561).

COMMENTS—*Phacopsis oxyspora* var. *defecta* is distributed in Asia, Australia, Europe, North America, and South America (Triebel & al. 1995). From India, *P. oxyspora* var. *defecta* is being reported from Himachal Pradesh and Uttarakhand. The closely related *Punctelia oxyspora* differs in having I+ violet reaction of hypothecium, while most other characters overlap. Our Indian specimens of *Phacopsis oxyspora* var. *defecta* seem more similar to *Punctelia oxyspora*, but we need to study the type material of the variety before considering our material as a new taxon. *Phacopsis oxyspora* var. *defecta* is known to occur on *Hypotrachyna incognita, H. sinuosa* (Sm.) Hale, *Notoparmelia tenuirima* (Hook. f. & Taylor) A. Crespo & al., *Parmelia fraudans* (Nyl.) Nyl., *P. saxatilis* (L.) Ach., *P. sulcata* Taylor, *Punctelia punctilla* (Hale) Krog, *P. rudecta* (Ach.) Krog, *P. semansiana* (W.L. Culb. & C.F. Culb.) Krog, and *P. subrudecta*.

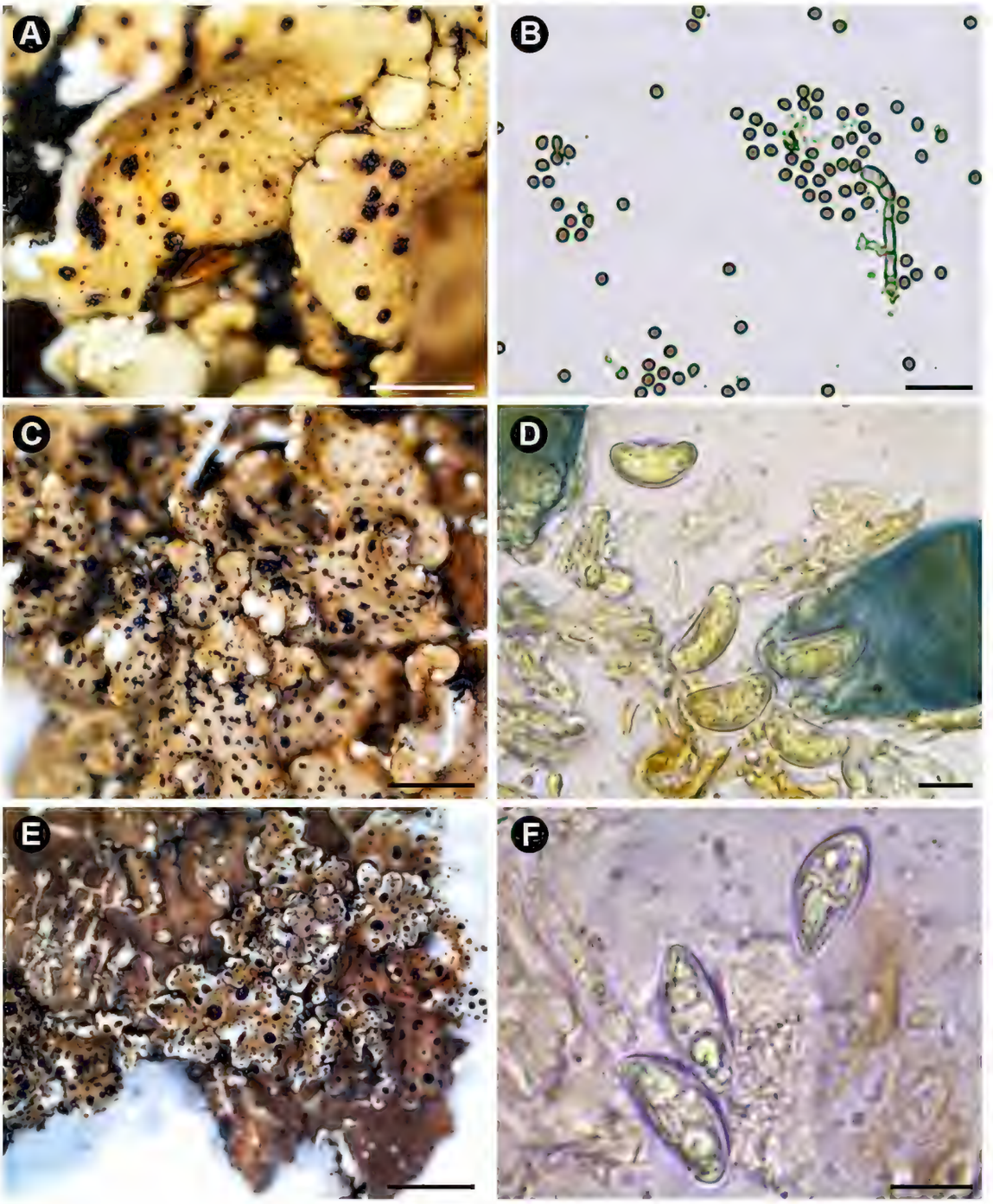

Fig. 1. ***Cladophialophora* aff. *megalosporae*** (LWG 14694): A. sporodochia developing on the thallus of *Hypotrachyna scytophylla*; B. conidiophore, conidiogenous cells, and conidia; ***Nesolechia falcispora*** (LWG 21404): C. apothecia immersed on the thallus of *Punctelia subrudecta*; D. falciform ascospores; ***Phacopsis oxyspora* var. *defecta*** (LWG 15782): E. apothecia spread on the thallus of *Punctelia rudecta*; F. ellipsoid ascospores. Scale bars: A, C, E = 0.2 mm; B, D, F = 10 μm.

Punctelia oxyspora (Tul.) Divakar, A. Crespo & Lumbsch,
Fung. Divers. 84: 114, 2017. FIG. 2A,B

APOTHECIA immersed in host lichen thalli, round, crowded, dark brown in color, 0.2–0.5 mm in diam., margin indistinct; EXCIPULUM hyaline, 12–38 µm thick; EPIHYMENIUM brown, 12–15 µm high; HYMENIUM hyaline, 50–70 µm high, I–; PARAPHYSES septate, anastomosed, with brown to dark brown swollen tips; HYPOTHECIUM colorless, 60–100 µm high, I+ violet; ASCI clavate, 8-spored, 46–50 µm, I+ blue; ASCOSPORES ellipsoid, hyaline, (14.1–)14.3–16.3(–17.3) × (5.1–)5.5–6.5(–7.2) µm, l/b ratio (2.0–)2.3–2.9 (–3.0), (n = 15).

SPECIMEN EXAMINED: **INDIA, HIMACHAL PRADESH, Kinnaur district**, Rackshum-Chitkul, elev. 3500 m, on *Melanelixia glabratula* growing on *Acer* tree trunk, 5 November 2003, Upreti, Srivastava & Prakash 03-002776 (LWG 17219).

COMMENTS—*Punctelia oxyspora* has been reported from Asia, Europe, and North America (Triebel & al. 1995). From India, the species is being reported from Himachal Pradesh state. The closely related *Phacopsis oxyspora* var. *defecta* differs in having I– hypothecium. *Punctelia oxyspora* occurs on *Hypotrachyna nepalensis* (Taylor) Divakar & al., *Melanohalea olivacea* (L.) O. Blanco & al., *Melanelixia glabratula* (Lamy) Sandler & Arup, *Parmelia fraudans, P. saxatilis, P. sulcata, Platismatia glauca* (L.) W.L. Culb. & C.F. Culb., and *Punctelia rudecta*.

Sclerococcum phaeophysciae Diederich & van den Boom,
Bull. Soc. Naturalistes Luxemb. 119: 72, 2017. FIG. 2C,D

SPORODOCHIA dark brown to black colored, superficial on lichen thallus, round to elongate, 0.4–0.7 mm; CONIDIOPHORES aggregated, not branched, hyaline to pale brown; CONIDIOGENOUS CELLS terminal, hyaline to pale brown; CONIDIA pale brown, 1-septate, subspherical to ellipsoid, I–, (12.1–)13.2–15.3(–16.9) × (3.6–)7.6–9.6(–10.8) µm, l/b ratio (1.3–)1.4–1.9 (–2.5) µm, (n = 50).

SPECIMEN EXAMINED: **INDIA, TAMIL NADU, Nilgiri Hills**, Emerald Beat, opposite Mukurti lake and Nilgiri Peak, elev. 2286 m., on *Hypotrachyna exsecta* growing on bark of *Rhododendron* tree, 25 December 1971, K.P. Singh (LWG-LWU 71.755).

COMMENTS—*Sclerococcum phaeophysciae* is known from Belgium, Germany, Luxembourg, and Netherlands (Diederich & van den Boom 2017). From India, the species is being reported from Tamil Nadu. The only other *Sclerococcum* species known to have 1-septate conidia is *S. montagnei* Hafellner, which is distinguished by much smaller (10–13 × 6–9 µm)

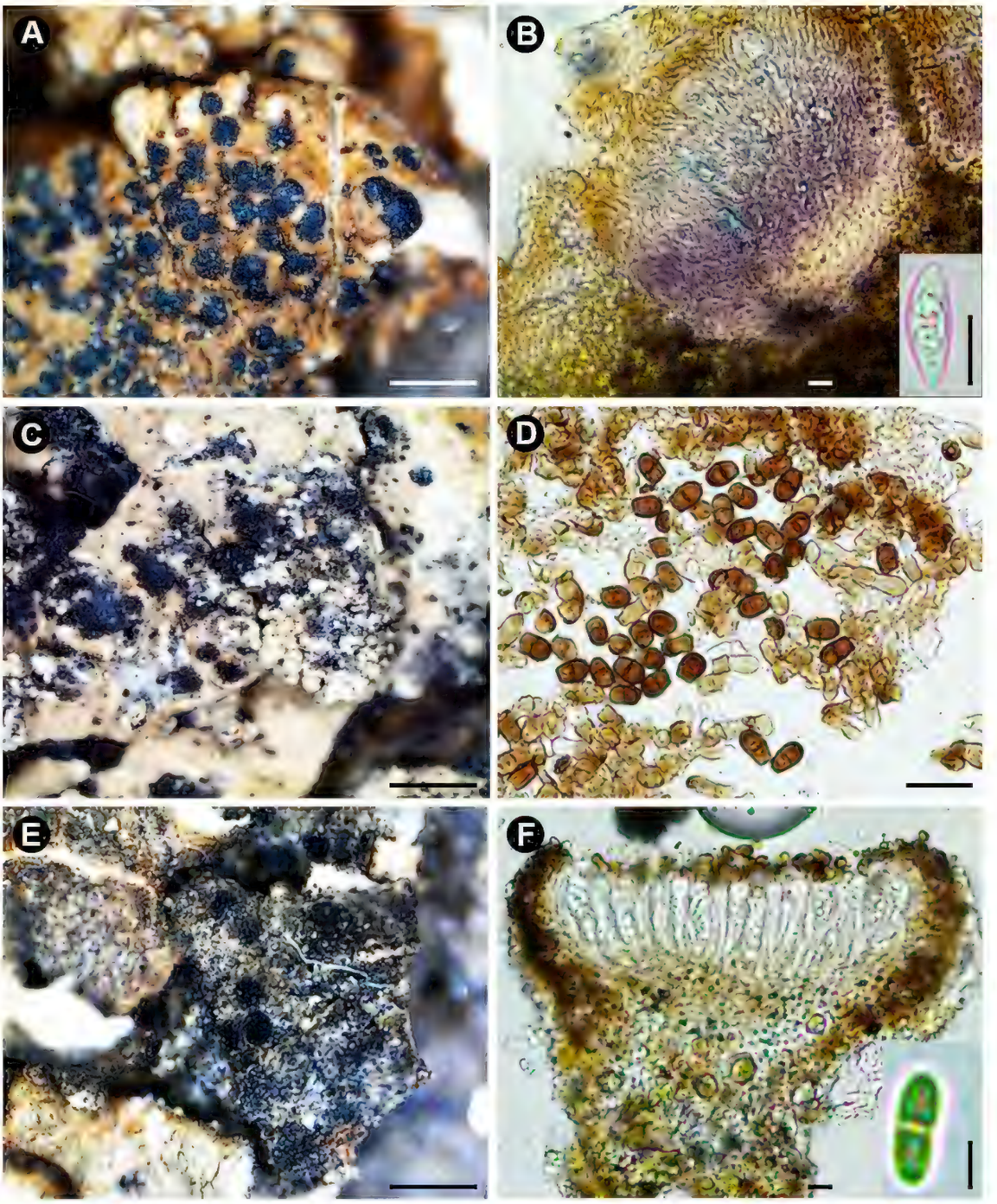

Fig. 2. ***Punctelia oxyspora*** (LWG 17219): A. apothecia; B. section of ascomata with I+ violet hypothecium (inset: an enlarged view of ascospore); ***Sclerococcum phaeophysciae*** (LWG 71.755): C. sporodochia developing on the thallus of *Hypotrachyna exsecta*; D. conidiophores, conidiogenous cells, and conidia; ***Scutula epiblastematica*** (LWG 25892): E. apothecia on thallus of *Xanthoparmelia stenophylla*; F. section of ascomata (inset: an enlarged view of ascospore). Scale bars: A, C, E = 0.2 mm; B, F = 10 µm; D = 30 µm.

conidia, which occasionally can be aseptate or submuriform. Previously, *S. phaeophysciae* was reported growing on *Phaeophyscia orbicularis* (Neck.) Moberg (Diederich & van den Boom 2017), but in India, it was found growing on *Hypotrachyna exsecta* (Taylor) Hale.

Scutula epiblastematica (Wallr.) Rehm,
Rabenh. Krypt. Fl. ed. 2, 1(3): 322, 1890. FIG. 2E,F

APOTHECIA numerous, aggregated, sessile, adnate, scattered, 0.1–0.3 mm diam., black, margin distinct, black; EXCIPULUM olivaceous to brown, 17–24 µm thick, not carbonaceous; EPIHYMENIUM brown, 6–10 µm high; HYMENIUM hyaline, 21–30 µm high, I+ blue; PARAPHYSES hyaline, unbranched, capitate, tips swollen, brown; HYPOTHECIUM hyaline, 15–20 µm high, I–; ASCI 8-spored, clavate, 20–25 × 3–6 µm; ASCOSPORES hyaline, 1-septate, ellipsoid, I–, (7.2–)7.7– 9.9(–11.8) × (2.2–)2.7–3.9(–5.0) µm, l/b ratio (2.0–)2.4–3.1 (–3.4) µm, (n = 28).

SPECIMENS EXAMINED: **INDIA, HIMACHAL PRADESH, Kinnaur district**, Recong Peo, in and around Kalpa, elev. 2950 m, on *Xanthoparmelia stenophylla* growing on rock, 3 November 2003, Upreti, Srivastava & Prakash 03-002657 (LWG 25892); **JAMMU & KASHMIR, Pahalgam**, on the left of the river; elev. 2134 m, on *Melanelixia glabra* growing on bark of tree trunk, 1 July 1977, K. Dange 77.409 (LWG-LWU 41226).

COMMENTS—*Scutula epiblastematica* has been reported from Africa, Asia, Europe, and North America (Holien 2005). In India, the species is being reported from Himachal Pradesh and Jammu & Kashmir. The closely related species *S. tuberculosa* (Th. Fr.) Rehm and *S. miliaris* (Wallr.) P. Karst. differ from *S. epiblastematica* by having longer and broader (10–14 × 4–6 µm) ascospores (Wedin & al. 2007). *S. epiblastematica* was earlier reported to grow on different *Peltigera* species, but in India it was found growing on *Melanelixia glabra* (Schaer.) O. Blanco & al. and *Xanthoparmelia stenophylla* (Ach.) Ahti & D. Hawksw.

Spirographa lichenicola (D. Hawksw. & B. Sutton) Flakus, Etayo & Miądl.,
Pl. Fung. Syst. 64: 328, 2019. FIG. 3A,B

CONIDIOMATA pycnidial, pale brown, immersed to erumpent, solitary, sometimes in group, making the nearby thallus area discolored and surrounded by a black circular necrotic margin, ostiole invisible; PYCNIDIAL WALL hyaline; CONIDIOPHORES hyaline, septate and sometimes branched, 25–35 µm high; CONIDIA hyaline, Y-shaped, aseptate, with two distinct arms, I–, main conidial axes (6.0–)6.3–7.3(–7.6) × (1.5–)1.6–1.8(–1.9) µm, l/b ratio (3.2–)3.5–4.3(–4.8), (n = 11).

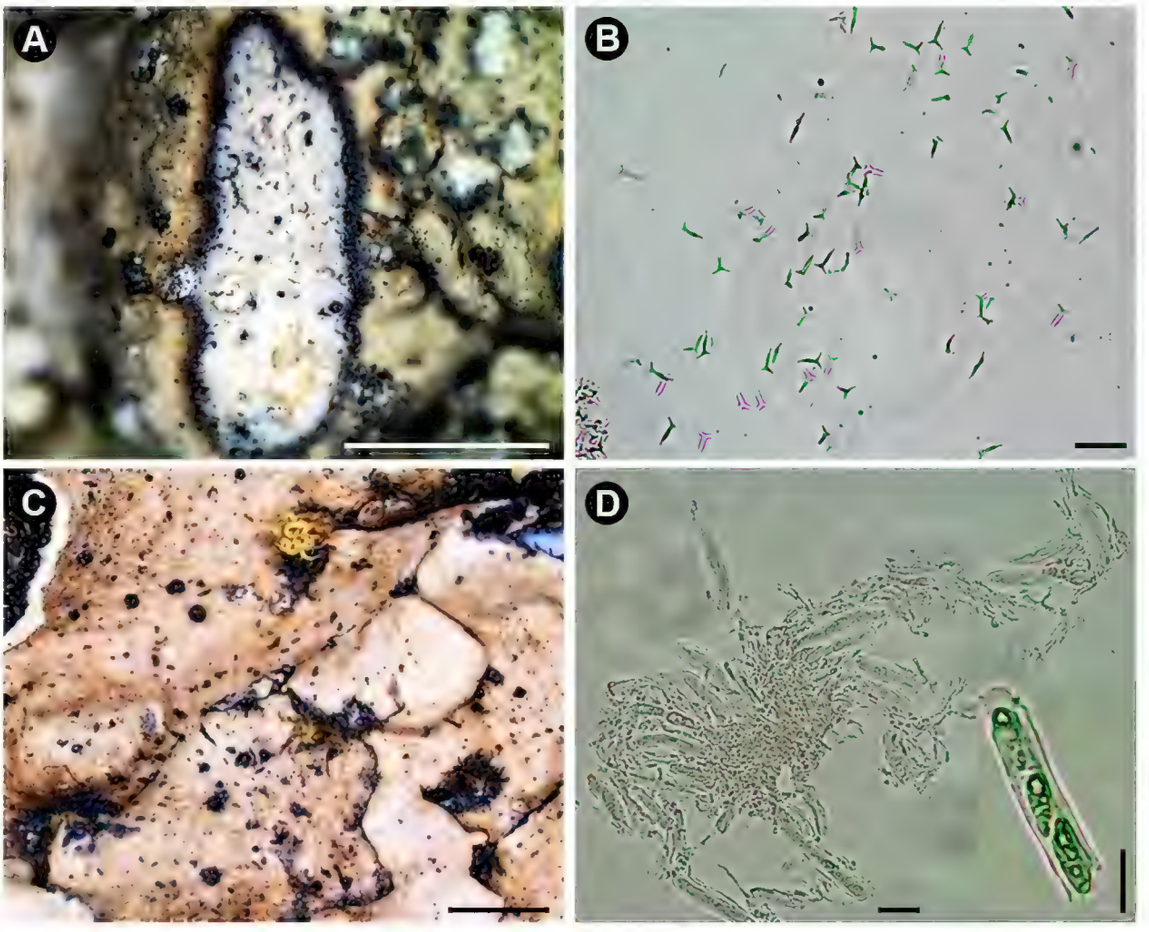

Fig. 3. ***Spirographa lichenicola*** (LWG 008849): A. infected area on thallus; B. Y-shaped conidia; ***Zwackhiomyces kantvilasii*** (LWG 19790): C. perithecia; D. section of perithecia (inset: an enlarged view of ascospore). Scale bars: A = 0.1 mm; B = 20 µm; C = 0.2 mm; D = 10 µm.

Specimens examined: **INDIA, Himachal Pradesh, Kullu district**, Great Himalayan National Park, Sairopa, elev. 1440 m, on *Canoparmelia texana* growing on fallen twigs, 10 November 2002, S. Nayaka & R. Srivastava 02-000543 (LWG 008849); **Uttarakhand, Chamoli district**, Gwaldam, elev. 1650 m, on *C. ecaperata* growing on bark of *Taxus*, 03 May 2015, S. Rawat 15-27383 (LWG 33010); **Uttarkashi district**, Govind Wildlife Sanctuary, Judatal to Kedarnath, elev. 3400 m, 30.0335°N 78.1795°E, on *C. texana* growing on bark, 06 October 2013, R. Bajpai 13-020160 (LWG 17325).

Comments—*Spirographa lichenicola* has been reported from British Isles (Hawksworth 1976), Africa, Australia, and North America (Hafellner & al. 2002), Bosnia and Herzegovina (Bilovitz & al. 2010), Bolivia (Flakus & Kukwa 2012), and Russia (Himelbrant & al. 2013). From India, the species is being reported from the states of Himachal Pradesh and Uttarakhand. *Spirographa lichenicola* differs from all other *Spirographa* species because of the absence of bulbous arms (Punithalingam 2003). The closely related

S. limaciformis (Piroz.) Flakus & al. differs from *S. lichenicola* with much larger (≥13–22 µm) conidia. *Spirographa lichenicola* is known to occur on *Canoparmelia ecaperata* (Müll. Arg.) Elix & Hale, *C. texana* (Tuck.) Elix & Hale, *Lecanora chlarotera* Nyl., *Parmelia sulcata, Melanohalea olivacea, Parmelia saxatilis,* and *Platismatia glauca.*

Zwackhiomyces kantvilasii S.Y. Kondr.,
Muelleria 9: 98, 1996. Fig. 3c,d

Perithecia black, globose, scattered, semi-immersed to superficial on lichen thallus; Perithecial walls 21–34 µm thick, brown throughout; Hamathecium hyaline, I–; Paraphyses branched; Asci 4-spored, cylindrical, 50–80 × 8–10 µm; Ascospores hyaline, 1-septate, ellipsoid, I–, 3–4 guttulate, (14.2–)14.8–16.6(–17.7) × (4.3–)4.5–5.5(–5.7) µm, l/b ratio (2.5–)2.8–3.6(–3.7), (n = 11).

Specimen examined: **INDIA, Uttarakhand, Chamoli district**, between Gondar and Laink, elev. 1550 m, on *Myelochroa irrugans* growing on rock, 20 September 1975, A. Singh & M. Ranjan 107082 (LWG 19790).

Comments—*Zwackhiomyces kantvilasii* was previously reported from Tasmania (Kondratyuk 1996), Europe (Berger & Zimmermann 2016), and Japan (Zhurbenko & al. 2015). From India, the species is being reported from Uttarakhand state. *Zwackhiomyces kantvilasii* closely resembles *Z. physciicola* Alstrup, which differs in having 4–6-spored asci. In addition, the spores of *Z. physciicola* are much longer and broader (18–22 × 5.5–6.5 µm). *Zwackhiomyces kantvilasii* was earlier reported as occurring only on the thallus of *Parmotrema* spp., but in India, it was found growing on *Myelochroa irrugans* (Nyl.) Elix & Hale.

Acknowledgments

The authors thank the Director CSIR-NBRI, Lucknow for providing laboratory facilities and financial support under project OLP101, and SS is thankful to the Council of Scientific and Industrial Research (CSIR), New Delhi for financial support under the CSIR-Junior Research Fellowship. One of the authors (SJ) thanks the Department of Science and Technology (DST), New Delhi for the financial assistance under DST-INSPIRE Faculty scheme (IFA18-LSPA 124). The authors are also grateful to Prof. S.Y. Kondratyuk (M.H. Kholodny Institute of Botany, Kyiv, Ukraine) and Dr. Biju Haridas (KSCSTE-Jawaharlal Nehru Tropical Botanical Garden & Research Institute, India) for their valuable comments and suggestions on the manuscript (CSIR-NBRI Manuscript No.: CSIR-NBRI_MS/2021/09/02).

Literature cited

Berger F, Zimmermann E. 2016. Addition to the lichen flora of Madeira with special focus on lichenicolous fungi. Herzogia 29: 235–276. https://doi.org/10.13158/heia.29.2.2016.235

Bilovitz PO, Türk R, Mayrhofer H. 2010. Additional lichens and some lichenicolous fungi from the Una National Park (Bosnia and Herzegovina). Fritschiana 67: 27–32.

Diederich P, van den Boom P. 2017. *Sclerococcum phaeophysciae* and *S. toensbergii*, two new lichenicolous asexual ascomycetes, with a revised key to the species of *Sclerococcum*. Bulletin de la Société des Naturalistes Luxembourgeois 119: 71–78.

Diederich P, Ertz D, Lawrey JD, Sikaroodi M, Untereiner WA. 2013. Molecular data place the hyphomycetous lichenicolous genus *Sclerococcum* close to *Dactylospora* (*Eurotiomycetes*) and *S. parmeliae* in *Cladophialophora* (*Chaetothyriales*). Fungal Diversity 58: 61–72. https://doi.org/10.1007/s13225-012-0179-4

Diederich P, Lawrey JD, Ertz D. 2018. The 2018 classification and checklist of lichenicolous fungi, with 2000 non-lichenized, obligately lichenicolous taxa. Bryologist 121: 340–425. https://doi.org/10.1639/0007-2745-121.3.340

Flakus A, Kukwa M. 2012. New records of lichenicolous fungi from Bolivia. Opuscula Philolichenum 11: 36–48.

Hafellner J, Triebel D, Ryan BD, Nash III TH. 2002. On lichenicolous fungi from North America. II. Mycotaxon 84: 293–329.

Hawksworth DL. 1976. New and interesting microfungi from Slapton, South Devonshire: *Deuteromycotina* III. Transactions of the British Mycological Society 67: 51–59. https://doi.org/10.1016/S0007-1536(76)80007-1

Himelbrant DE, Motiejūnaitė J, Pykälä J, Schiefelbein U, Stepanchikova IS. 2013. New records of lichens and allied fungi from the Leningrad Region, Russia. IV. Folia Cryptogamica Estonica 50: 23–31. https://doi.org/10.12697/fce.2013.50.04

Holien H. 2005. Additions to the Norwegian flora of lichens and lichenicolous fungi III. Graphis Scripta 17: 62–64.

Joshi Y. 2018. Documentation of lichenicolous fungi from India – some additional reports. Kavaka 51: 30–34.

Joshi Y. 2020. *Polycoccum hawksworthianum* (*Polycoccaceae, Trypetheliales*), a new lichenicolous fungus on *Lepra* and *Varicellaria* from India. Acta Botanica Hungarica 62: 217–224. https://doi.org/10.1556/034.62.2020.3-4.2

Joshi Y. 2021. Two new species of lichenicolous fungus *Sclerococcum* (*Dactylosporaceae, Sclerococcales*) from India. Acta Botanica Hungarica 63: 67–76. https://doi.org/10.1556/034.63.2021.1-2.5

Joshi Y, Bisht K, Suda N. 2020a. Lichenicolous fungi colonizing members of the lichen-forming family *Teloschistaceae* in India. Kew Bulletin 75(54): [7 p.]. https://doi.org/10.1007/s12225-020-09912-5

Joshi Y, Kumar P, Yadav AL, Suda N, Halda JP. 2020b. Distribution and diversity of lichenicolous fungi from western Himalayan cold deserts of India, including a new *Zwackhiomyces* species. Sydowia 73: 171–183. https://doi.org/12905/0380.sydowia73-2020-0171

Kondratyuk SY. 1996. New species of *Pronectria, Vouauxiomyces, Wentiomyces* and *Zwackhiomyces* from Australasia. Muelleria 9: 93–104.

Punithalingam E. 2003. Nuclei, micronuclei and appendages in tri- and tetraradiate conidia of *Cornutispora* and four other coelomycete genera. Mycological research 107: 917-948. https.//doi.org/10.1017/S0953756203008037

Singh P, Singh KP. 2019. *Buelliella indica* (*Dothideomycetes*), a new lichenicolous species from India. Acta Botanica Hungarica 61: 435–439. https://doi.org/10.1556/034.61.2019.3-4.12

Triebel D, Rambold G, Elix, JA. 1995. A conspectus of the genus *Phacopsis* (*Lecanorales*). Bryologist 98: 71–83. https://doi.org/10.2307/3243643

Wedin M, Ihlen PG, Triebel D. 2007. *Scutula tuberculosa,* the correct name of the *Scutula* growing on *Solorina* spp., with a key to *Scutula* s. str. in the Northern Hemisphere. Lichenologist 39: 329–333. https://doi.org/10.1017/S0024282907006949

Zhurbenko MP, Frisch A, Ohmura Y, Thor G. 2015. Lichenicolous fungi from Japan and Korea: new species, new records and a first synopsis for Japan. Herzogia 28: 762–789. https://doi.org/10.13158/heia.28.2.2015.762

Zhurbenko MP, Diederich P, Gagarina LV. 2020. Lichenicolous fungi from Vietnam, with the description of four new species. Herzogia 33: 525–543. https://doi.org/10.13158/heia.33.2.2020.525